

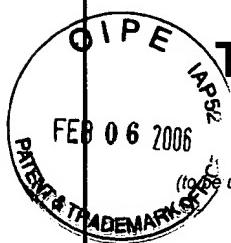
09/686 031

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# TRANSMITTAL FORM

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Total Number of Pages in This Submission

Patent Number	Patent#: 6993068 B1
Issue Date	Issued: January 31, 2006
First Named Inventor	Mikael R. Isakssaon et al.
Art Unit	2637
Examiner Name	Edith M. Chang
Total Number of Pages in This Submission	S1022.80549US00

**ENCLOSURES (Check all that apply)**

<input type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Drawing(s)	<input type="checkbox"/> After Allowance Communication to TC
<input type="checkbox"/> Fee Attached	<input type="checkbox"/> Licensing-related Papers	<input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences
<input type="checkbox"/> Amendment/Reply	<input type="checkbox"/> Petition	<input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
<input type="checkbox"/> After Final	<input type="checkbox"/> Petition to Convert to a Provisional Application	<input type="checkbox"/> Proprietary Information
<input type="checkbox"/> Affidavits/declaration(s)	<input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address	<input type="checkbox"/> Status Letter
<input type="checkbox"/> Extension of Time Request	<input type="checkbox"/> Terminal Disclaimer	<input type="checkbox"/> Other Enclosure(s) (please Identify below):
<input checked="" type="checkbox"/> Certificate of Correction SB/44	<input type="checkbox"/> Request for Refund	Copy of 4/29/05 Amend Copy of Cols. 4 and 5 of US6,993,068 Copy of Examiner's Amendment Post Card
<input checked="" type="checkbox"/> Request for Certificate of Correction	<input type="checkbox"/> CD, Number of CD(s) _____	
<input type="checkbox"/> Certified Copy of Priority Document(s)	<input type="checkbox"/> Landscape Table on CD	
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<input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53		
	<b>Remarks</b>	

**Certificate**

FEB 09 2006

**of Correction****SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT**

Firm Name	WOLF, GREENFIELD & SACKS, P.C.		
Signature			
Printed name	William R. McClellan		
Date	February 3, 2006	Reg. No.	29,409

**Certificate of Mailing Under 37 CFR 1.8(a)**

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as First Class Mail, in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Dated: February 3, 2006

Signature: (Gail Driscoll)

FEB 09 2006



Docket No.: S1022.80549US00  
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Mikael ISAKSSON Lennart OLSSON and Denis Julien Gilles MESTDAGH  
Serial No.: 09/686031 Patent No.: 6,993,068 B1  
Filed: October 11, 2000 Issued: January 31, 2006  
For: METHOD FOR ESTIMATING AND SYNCHRONIZING FRAME BOUNDARIES  
OF MISALIGNED CROSS-TALK SIGNALS IN A DMT SYSTEM

Examiner: Edith M. Chang  
Art Unit: 2637 Confirmation No.: 5932

**Certificate of Mailing Under 37 CFR 1.8(a)**

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Dated: February 3, 2006

  
Gail Driscoll

**REQUEST FOR CERTIFICATE OF CORRECTION  
PURSUANT TO 37 CFR 1.322**

Attention: Certificate of Correction Branch  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir/Madam:

Upon reviewing the above-identified patent, Patentee noted typographical errors which should be corrected.

**In the Claims:**

The errors shown below in bold text were introduced into claims 5, 6 and 10 when the changes in the Examiner's amendment, attached to the Notice of Allowance, were incorporated into the claims as allowed. Claims 5, 6 and 10 are reproduced below.

5. A method, as claimed in claim 3 further comprising the step of, when a time offset of cross-talk components of a cross-talker is estimated at a VDSL Transceiver Unit-Optical Network Unit (VTU-O), using the time offset **is used** to

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adjust its clock and frame boundaries to align with the cross-talker so that orthogonality is achieved and distortion is minimized.

Page 2, lines 12-13 of the Notice of Allowability read in part "...line 3: "the time offset is used" has been changed to "using the time offset"...".

In making this change the words "is used" should have been deleted as shown in bold in the reproduction of claim 5 above.

6. A method, as claimed in claim 3 further comprising the step of, when **if** an auto-correlation peak amplitude of a cross-talk component of a cross-talker is low, a VDSL Transceiver Unit-Optical Network Unit (VTU-O) choosing to not align its clock and frame boundaries since the cross-talker then does not significantly contribute to distortion and hence a threshold level is used.

Page 2, line 15 of the Notice of Allowability reads in part "Claim 6, line 2: "wherein, if" has been changed to "of, when"...".

In making this change the words "if" should have been deleted as shown in bold in the reproduction of claim 6 above.

10. In a Very high bit rate Digital Subscriber Line (VDSL) communications system comprising a plurality of modem pairs, each modem pair including a first VDSL modem and a second VDSL modem, a method comprising:

a) using the first VDSL modem of a first modem pair of the plurality of modem pairs to send a first discrete multitone (DMT) signal over a first transmission channel in a cable;

b) using the first VDSL modem of a second modem pair of the plurality of modem pairs to send a second DMT signal over a second transmission channel in the cable, wherein each DMT signal includes a DMT modulated carrier signal, wherein the DMT modulated carrier signal includes cyclic extensions, and wherein the cyclic extensions include a cyclic prefix appended to the beginning of the DMT modulated carrier signal and a cyclic suffix appended to the end of the DMT modulated carrier signal;

c) using the second VDSL modem of the first modem pair of the plurality of **modem modem** pairs to receive the first DMT signal on the first transmission channel, the first DMT signal including a crosstalk from the second DMT signal;

d) applying an autocorrelation function to the first DMT signal to generate a correlation signal, further comprising applying the autocorrelation function to the DMT modulated carrier signal using a delayed copy of the DMT modulated

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carrier signal in order to correlate the cyclic extensions of the DMT modulated carrier signal;

e) detecting, in the correlation signal, correlation maxima of the first DMT signal and correlation maxima of the crosstalk from the second DMT signal;

f) determining a time misalignment between the first DMT signal and the crosstalk from the second DMT signal based on a time shift of the correlation maxima of the first DMT signal and the correlation maxima of the crosstalk from the second DMT signal; and

g) adjusting a frame timing of the first modem of the first modem pair of the plurality of **modern** **modem** pairs based on the time misalignment.

Page 2, line 20 of the Notice of Allowability reads in part "and lines 12 & 24: "modem pair" have been changed to "the first" and "modem pair of the plurality of modem pairs" respectively."

In making these changes, the second occurrence of the word "modem" was erroneously changed to "modern" in both instances, as shown in bold in the reproduction of claim 10 above.

Patentees enclose herewith a highlighted copy of the Examiner's Amendment, the claims as they appeared on pages 3-5 of the amendment filed on April 29, 2005 and columns 5 and 6 of U.S. Patent No. 6,993,068. Also enclosed is a proposed Certificate of Correction effecting such amendments. Patentees respectfully solicit the granting of the requested Certificate of Correction.

Dated: February 3, 2006

Respectfully submitted,

By William R. McClellan  
William R. McClellan  
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### In the Claims

Please replace all prior versions of claims in the application with the following list of claims:

1. (Cancelled)
2. (Currently amended) A method, as claimed in claim 24 further comprising using an inherent property of the received DMT signal, wherein part of the signal is correlated, in the time domain, in terms of cyclic extensions.
3. (Currently amended) A method, as claimed in claim 24 further comprising estimating the time mis-alignment of the cross-talk signals as components of cross-talkers from the distance between the correlation maximum corresponding to thea desired signal (known location) and other correlation maxima.
4. (Currently amended) A method, as claimed in claim 3 further comprising the step ~~wherein the amplitude of a correlation maximum is a relative measure of the power of the corresponding cross-talker of estimating the relative power of a corresponding cross-talker from the amplitude of a correlation maximum.~~
5. (Currently amended) A method, as claimed in claim 3 further comprising the step wherein, when a time offset of the cross-talk components of a cross-talker is estimated at thea VDSL Transceiver Unit-Optical Network Unit (VTU-O), this information the time offset is used to adjust its clock and frame boundaries to align with the cross-talker and hence orthogonality is achieved and distortion is minimized.
6. (Currently amended) A method, as claimed in claim 3 further comprising the step wherein, if thean auto-correlation peak amplitude of thea cross-talk signal component of a cross-talker is low, thea VDSL Transceiver Unit-Optical Network Unit (VTU-O) can choose to not

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align clock and frame boundaries since the cross-talker then does not significantly contribute to distortion and hence a threshold level is used.

7. (Previously presented) A method, as claimed in claim 24 wherein the method can be used for applications including Near End Cross-Talk (NEXT) cancellation algorithms and multi-user detection algorithms.

8. (Currently amended) A method, as claimed in claim 24 wherein, when the method is used in every starting-up modem in the telecommunications transmission system, all modems that cause interference in each other's receivers become aligned to the same frame timing.

9. (Currently amended) In a communication system having a transmission channel, a method comprising steps of:

a) receiving a carrier signal on the transmission channel, wherein the carrier signal is part of a Discrete Multi Tone (DMT) modulated carrier signal, wherein the DMT modulated carrier signal includes cyclic extensions, and wherein the cyclic extensions include a cyclic prefix appended to the beginning of the DMT modulated carrier signal and a cyclic suffix appended to the end of the DMT modulated carrier signal;

b) applying an autocorrelation function to the carrier signal to generate a correlation signal, further comprising applying an autocorrelation function to the DMT modulated carrier signal using a delayed copy of the DMT modulated carrier signal in order to correlate the cyclic extensions of the DMT modulated carrier signal;

c) detecting correlation maxima of the carrier signal and correlation maxima of a crosstalk signal in the correlation signal;

d) determining a time misalignment between the carrier signal and the crosstalk signal based on a time shift of the correlation maxima of the carrier signal and the crosstalk signal; and

e) adjusting a frame timing of the carrier signal based on the time misalignment.

10.-13. (Cancelled)

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14. (Currently amended) In a Very high bit rate Digital Subscriber Line (VDSL) communications system comprising a plurality of modem pairs, each modem pair including a first VDSL modem and a second VDSL modem, the method comprising:

- a) using the first VDSL modem of a first modem pair of the plurality of modem pairs to send a first discrete multitone (DMT) signal over a first transmission channel in a cable;
- b) using the first VDSL modem of a second modem pair of the plurality of modem pairs to send a second DMT signal over a second transmission channel in the cable, wherein each DMT signal includes a DMT modulated carrier signal, wherein the DMT modulated carrier signal includes cyclic extensions, and wherein the cyclic extensions include a cyclic prefix appended to the beginning of the DMT modulated carrier signal and a cyclic suffix appended to the end of the DMT modulated carrier signal;
- c) using the second VDSL modem of a first modem pair to receive the first DMT signal on the first transmission channel, the first DMT signal including a crosstalk from the second DMT signal;
- d) applying an autocorrelation function to the first DMT signal to generate a correlation signal, further comprising applying an autocorrelation function to the DMT modulated carrier signal using a delayed copy of the DMT modulated carrier signal in order to correlate the cyclic extensions of the DMT modulated carrier signal;
- e) detecting, in the correlation signal, correlation maxima of the first DMT signal and correlation maxima of the crosstalk from the second DMT signal;
- f) determining a time misalignment between the first DMT signal and the crosstalk from the second DMT signal based on a time shift of the correlation maxima of the first DMT signal and the correlation maxima of the crosstalk from the second DMT signal; and
- g) adjusting a frame timing of the first modem of the first modem pair based on the time misalignment.

15.-18. (Cancelled)

19. (Currently amended) In a communication system having a transmission channel, an apparatus comprising:

of cross-talkers from the distance between the correlation maximum corresponding to a desired signal and other correlation maxima.

4. A method, as claimed in claim 3 further comprising the step of estimating the relative power of a corresponding cross-talker from the amplitude of a correlation maximum. 5

5. A method, as claimed in claim 3 further comprising the step of, when a time offset of cross-talk components of a cross-talker is estimated at a VDSL Transceiver Unit-Optical Network Unit (VTU-O), using the time offset is used to 10 adjust its clock and frame boundaries to align with the cross-talker so that orthogonality is achieved and distortion is minimized.

6. A method, as claimed in claim 3 further comprising the step of, when if an auto-correlation peak amplitude of a 15 cross-talk component of a cross-talker is low, a VDSL Transceiver Unit-Optical Network Unit (VTU-O) choosing to not align its clock and frame boundaries since the cross-talker then does not significantly contribute to distortion and hence a threshold level is used. 20

7. A method, as claimed in claim 1 wherein the method is used for applications including Near End Cross-Talk (NEXT) cancellation algorithms and multi-user detection algorithms.

8. A method, as claimed in claim 1 wherein, when the 25 method is used in every starting-up modem in the telecommunications transmission system, modems that cause interference in each other's receivers become aligned to the same frame timing.

9. In a communication system having a transmission 30 channel, a method comprising the steps of:

a) receiving a carrier signal on the transmission channel, wherein the carrier signal is part of a Discrete Multi Tone (DMT) modulated carrier signal, wherein the DMT modulated carrier signal includes cyclic extensions, and wherein the cyclic extensions include a cyclic prefix appended to the beginning of the DMT modulated carrier signal and a cyclic suffix appended to the end of the DMT modulated carrier signal; 35

b) applying an autocorrelation function to the carrier 40 signal to generate a correlation signal, further comprising applying an autocorrelation function to the DMT modulated carrier signal using a delayed copy of the DMT modulated carrier signal in order to correlate the cyclic extensions of the DMT modulated carrier signal; 45

c) detecting correlation maxima of the carrier signal and correlation maxima of a crosstalk signal in the correlation signal;

d) determining a time misalignment between the carrier signal and the crosstalk signal based on a time shift of 50 the correlation maxima of the carrier signal and the crosstalk signal; and

e) adjusting a frame timing of the carrier signal based on the time misalignment. 55

10. In a Very high bit rate Digital Subscriber Line (VDSL) communications system comprising a plurality of modem pairs, each modem pair including a first VDSL modem and a second VDSL modem, a method comprising:

a) using the first VDSL modem of a first modem pair of the plurality of modem pairs to send a first discrete 60 multitone (DMT) signal over a first transmission channel in a cable;

b) using the first VDSL modem of a second modem pair of the plurality of modem pairs to send a second DMT signal over a second transmission channel in the cable, wherein each DMT signal includes a DMT modulated carrier signal, wherein the DMT modulated carrier signal includes cyclic extensions, and wherein the cyclic extensions include a cyclic prefix appended to the beginning of the DMT modulated carrier signal and a cyclic suffix appended to the end of the DMT modulated carrier signal;

c) using the second VDSL modem of the first modem pair of the plurality of modem pairs to receive the first DMT signal on the first transmission channel, the first DMT signal including a crosstalk from the second DMT signal;

d) applying an autocorrelation function to the first DMT signal to generate a correlation signal, further comprising applying the autocorrelation function to the DMT modulated carrier signal using a delayed copy of the DMT modulated carrier signal in order to correlate the cyclic extensions of the DMT modulated carrier signal;

e) detecting, in the correlation signal, correlation maxima of the first DMT signal and correlation maxima of the crosstalk from the second DMT signal;

f) determining a time misalignment between the first DMT signal and the crosstalk from the second DMT signal based on a time shift of the correlation maxima of the first DMT signal and the correlation maxima of the crosstalk from the second DMT signal; and

g) adjusting a frame timing of the first modem of the first modem pair of the plurality of modem pairs based on the time misalignment.

11. In a communication system having a transmission channel, an apparatus comprising:

a) means for receiving a carrier signal on the transmission channel, wherein the carrier signal is part of a Discrete Multi Tone (DMT) modulated carrier signal, wherein the DMT modulated carrier signal includes cyclic extensions, and wherein the cyclic extensions include a cyclic prefix appended to the beginning of the DMT modulated carrier signal and a cyclic suffix appended to the end of the DMT modulated carrier signal;

b) means for applying an autocorrelation function to the carrier signal to generate a correlation signal, further comprising means for applying the autocorrelation function to the DMT modulated carrier signal using a delayed copy of the DMT modulated carrier signal in order to correlate the cyclic extensions of the DMT modulated carrier signal;

c) means for detecting correlation maxima of the carrier signal and correlation maxima of a crosstalk signal in the correlation signal;

d) means for determining a time misalignment between the carrier signal and the crosstalk signal based on a time shift of the correlation maxima of the carrier signal and the crosstalk signal; and

e) means for adjusting a frame timing of the carrier signal based on the time misalignment.

\* \* \* \* \*

PPD 09 2006

**EXAMINER'S AMENDMENT**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with William R. McClellan on July 14, 2005.

2. The application has been amended as follows:

In the claims:

Claim 3, line 2: "mis-alignment" has been changed to "misalignment"; lines 3-4: "signal (known location)" has been changed to "signal".

Claim 5, line 2: "wherein," has been changed to "of,"; line 3: "the time offset is used" has been changed to "using the time offset"; line 4: "and hence" has been changed to "so that".

Claim 6, line 2: "wherein, if" has been changed to "of, when"; line 3: "can choose to not align clock" has been changed to "choosing to not align its clock".

Claim 7, lines 1-2: "method can be" has been changed to "method is".

Claim 9, line 2: "steps of" has been changed to "the steps of".

Claim 14, line 3: "the method" has been changed to "a method"; line 12: "a first" and lines 12 & 24: "modem pair" have been changed to "the first" and "modem pair of the plurality of modem pairs" respectively.

7-15-05

**UNITED STATES PATENT AND TRADEMARK OFFICE  
CERTIFICATE OF CORRECTION**

Page 1 of 1

PATENT NO. : 6993068 *B1*

APPLICATION NO. : 09/686031

ISSUE DATE : January 31, 2006

INVENTOR(S) : Mikael Isaksson, Lennart Olsson and Denis Julien Gilles Mestdagh

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Claim 5, col. 5, line 10, should read:  
--Network Unit (VTU-O), using the time offset is—

Claim 6, col. 5, line 15, should read:  
--step of, when an auto-correlation peak amplitude of a —

Claim 10, col. 6, line 12 should read:  
--of the plurality of modem pairs to receive the first DMT—  
line 32 should read:  
--modem pair of the plurality of modem pairs based on--

**Certificate of Mailing Under 37 CFR 1.8(a)**

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the U.S. Postal Service on the date shown below with sufficient postage as First Class Mail, in an envelope addressed to: Attention: Certificate of Correction Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Dated: February 3, 2006

Signature: *Gail Driscoll* (Gail Driscoll)

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